CLAIMS

1. A soldering apparatus, preferably for soldering items that have been applied a soldering agent, where the soldering apparatus (2, 202) includes at least one soldering zone (6) ,where the soldering zone includes means (26, 216) for generating vapour, the apparatus being adapted to heat the items to be soldered to a temperature required for soldering by condensing the vapour, and where the soldering zone (6) includes gates (20,22, 214,212), where the soldering zone (6) contains a protective gas (30, 260), **characterised** in that the soldering zone includes means (28, 218) for shutting off the vapour generating means (26, 216), and that the soldering zone (6) is adapted for supplying means (30, 260) for forced condensing of condensing vapour at the end of a soldering process.

2. A soldering apparatus according to claim 1, **characterised** in that the apparatus is arranged to supply protective gas (30, 260) through ducts (34, 244) to the soldering zone at the start of a soldering process, the supplying of protective gas (30, 260) being effected in dependence of a measurement of the actual oxygen content in the soldering zone (6).

3. A soldering apparatus according to claim 1 or 2, **characterised** in that the apparatus is provided with suction facilities (36, 224) for removing condensing vapour and protective gas (30, 260) corresponding to the supplied amount of protective gas from the soldering zone (6) where the apparatus is adapted for supplying protective gas (30, 260) at a regulated temperature lower than the soldering temperature in the soldering zone (6) for achieving forced condensing of the condensing vapour, where the apparatus is adapted to supply protective gas (30, 260) to the soldering zone (6) at a first high temperature at the end of a soldering process, where the temperature is approached a second lower temperature over a period of time.

4. A soldering apparatus according to any preceding claim, **characterised** in that the apparatus is adapted for forced condensation by use of recirculation through condensing means (230, 234) and through means (232, 236, 320) for flux filtration.

5. A soldering apparatus according to any preceding claim, **characterised** in that the soldering zone (6) includes a vessel (26) to be heated by at least one heating element (40), where the vessel is covered by the means for shutting off (28, 218), including at least one fixed perforated plate (50) that may interact with at least one displaceable perforated plate (52) which may be displaced by at least one actuator (54).

6. A soldering apparatus according to any preceding claim, **characterised** in that the apparatus is adapted to have the means (28, 216) for shutting off the vessel (26) closed until the start of a soldering process, and that at least one heating element (40) may be activated at the start of the soldering process simultaneously with opening the means (28, 216) for shutting off the vessel (26), where the apparatus is adapted for closing the means (28, 216) for shutting off the vessel (26) simultaneously with regulating the means for heating (40) by ending a soldering process.

7. A soldering apparatus according to any preceding claim, **characterised** in that the apparatus includes a preheating zone (4) for preheating items (32, 210) to be soldered to a predetermined temperature, that the soldering apparatus (2, 202) includes at least one gate (20, 214) between the preheating zone (4) and the soldering zone (6), and that the preheating zone (4) includes at least one gate (18) at its entrance where the pre-heating zone is supplied with protective gas (30, 260), and that suction facilities from the preheating zone (4) reduces the oxygen content in the preheating zone (4).

8. A soldering apparatus according to any preceding claim, **characterised** in that the apparatus includes at least one cooling zone (8), that the apparatus includes at least one gate between the soldering zone (6) and the cooling zone (8), and that the cooling zone includes at least one gate (24) at the exit.

9. A soldering apparatus according to any preceding claim, **characterised** in that the soldering apparatus (2) includes means (60, 62, 64, 66, 68, 70, 72, 74) for determining the position of the items (32, 210) to be soldered, and that the opening and closing functions of the gates (18, 20, 22, 24, 212, 214) of the apparatus can be determined

from the position of the items (32, 210) and the actual conditions in the zones (4, 6, 8) of the apparatus.

10. An apparatus (2, 220) according to any preceding claim **characterized** in that the apparatus (2, 220) comprises means for condensation (230, 234) of a vapour (206) containing flux, where pumping means (246) circulate the vapour (206) containing flux through the condensation means (230, 234), where the condensation means (230, 234) comprise a heat exchanger (230, 234) for cooling the vapour (206) for flux and vapour condensation, which pumping means (246) are stopped during the soldering process, and started upon ending a solder process, where the pumping means (246) operate in a closed circuit (220) starting at an outlet (222) from the soldering process and ending at an inlet (248) to the soldering process, where the closed circuit (220) comprises at least a first heat exchanger (250) operating at a first temperature, and at least a second heat exchanger (252) operated at a second lower temperature, where the heat exchangers (250, 252) are placed in conjunction with liquid collecting means (256).

11. An apparatus according to any preceding claim, **characterized** in that the closed circuit (220) also comprises at least one heat exchanger (254) for heating protective gas (260) to a temperature below the condensing temperature of the vapour (206) before the protective gas (260) is returned to the soldering device in a time period after soldering is finished.

12. An apparatus according to any preceding claims 6-8, **characterized** in that liquefied solder heating medium (204, 304) is returned from the liquid collecting means (256, 356) through a conduit (258, 358) to a flux trap (322) comprising steps (324), which flux trap (322) is cooled by cooling means (326), first to a temperature for condensation and subsequently further cooled to a temperature for flux liquefying.

13. An apparatus according to any preceding claims 6-9, **characterized** in that the heat exchangers (250, 252) comprise cooling fins (262, 264) that are tilted against the inlet direction in order to return liquefied solder heating medium (204) and liquefied

or solidified flux, where protective gas (260) passes over and around the fins (262, 264).

14. An apparatus according to any preceding claim 6-10, **characterized** in that liquefied solder heating medium (204) and liquefied or solidified flux passes filter means (232, 236) before reaching collecting means (256), which filter means (232, 236) collect liquid or solidified flux and other unwanted chemical substances.

15. An apparatus according to any preceding claims 6-11, **characterized** in that liquid solder heating medium is collected at the surface of a tray placed under the soldering zone and led over the flux trap (322).

16. An apparatus according to one of the claims 6-12, **characterized** in that surfaces on elements in contact with flux (230, 234, 238, 256, 262, 264, 266, 322, 324) are coated with a material having ability not to fix liquid or solidified flux.

17. An apparatus according to any preceding claim, **characterized** in that the pressure in the soldering zone is reduced at the beginning of a soldering process, where the pressure is partly normalised by opening a valve for supply of protective gas into the soldering zone, where the pressure in the soldering zone is normalized by opening for supply of vapour.

18. A method for soldering in which items (32) to be soldered are applied a soldering agent in advance, where the items (32) are preheated in a first step (4), where the items (32) are soldered in a second step (6) in that condensing vapour heats the items to a temperature, which is higher than the melting point of the soldering agent, where the soldering items are cooled in a third step (8) subsequent to soldering, **characterized** in that the second step is effected in the presence of a protective gas (30), and that the second step includes shutting off the supply of vapour and forced condensing of vapour.

19. A method according to claim 18, **characterised** in that the supplying of protective gas is used as means for forced condensing of vapour.

20. A method according to claim 18 or 19 **characterized** in that the method comprises flux deposition in conjunction with vapour phase soldering, which soldering process leads to evaporation of flux and other chemical substances, where the vapour (206) of solder heating medium (204) containing flux and other chemical substances is drawn into a closed circuit (220) in time periods between or after soldering processes, where the closed circuit comprises at least a first condensation process (230) and a second condensation process (234), which first and second condensation processes (230, 234) take place at a first high temperature and at a second lower temperature, and liquid solder heating medium (204) is returned to the vapour phase soldering process.

21. A method according to any preceding claims 18-20, **characterized** in that the first temperature depends on the condensation temperature of the flux, where the second temperature depends on the condensation temperature of the solder heating medium (204).

22. A method according to any preceding claims 18-21, **characterized** in that the protective gas (260) is heated by heating means (238) to a temperature below the condensation temperature of the vapour (206) after it has passed through the condensing processes (230, 234) and before the protective gas is returned to the soldering chamber, which condensing processes (230, 234) and the heating process (238) take place in time periods after soldering of the elements (210).

23. A method according to any preceding claims 18-22, **characterized** in that the condensed heating medium (204) is returned to the process in that it is led through a flux depositing trap (322), which trap (322) comprises a cooling process for flux condensation and flux solidification.